20.(Currently Amended) A method of processing a proteinaceous material with enhanced solubility and color characteristics, the method comprising:

blending the proteinaceous material with a reducing agent to form a mixture; [and]

maintaining the mixture at a temperature greater than 90°C and [at a super-atmospheric pressure] a pressure greater than 10psig for a holding period to form a proteinaceous product; and

venting the pressure on the proteinaceous product.

REMARKS

The Office Action rejected claims 1-15 and 20-32 under 35 U.S.C. 103(a) as being unpatentable over JP 55-88662 (JP '662). (A copy of the translation of JP '662 is attached) The Office Action alleges that JP '662 discloses a process of preparing a soybean protein material wherein soybean material is extracted with a mixture of alcohol and a reducing agent at a temperature, for example, of 70°C. The Examiner indicates that JP '662 is silent regarding the holding time and such determination would have been well within the purview of one having ordinary skill in the art. The Office Action further alleges that the time and temperature recited in the present claims would have been obvious based on the inverse relationship between time and temperature.

Applicants submit that the present invention as claimed is not obvious under 35 U.S.C. 103(a) in view of JP '662. The claimed invention contains a number of differences that are not taught or suggested by the prior art. First, the process claimed in claims 1-15, 30-32 of the present invention uses significantly less alcohol than the JP '662 or no alcohol. According to the MPEP,

> "The law is replete with cases in which the difference between the claimed invention and the prior art is some range or other variable within the claims. . .In such a situation, the applicant must show that the particular range is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range." [MPEP2144.05 (III)]

The use of significantly less alcohol than the prior art would suggest to one of ordinary skill in the art that not all the undesirable compounds present in the reaction would be solubilized in the alcohol and therefore, removed upon removal of the alcohol by extraction. It is unexpected that using alcohol amounts as low as 1:0.1 solid to liquid ratio would remove significant amount of the undesirable components to provide enhanced coloration and dispersablity of the proteinaceous product. Furthermore, the use of lower amounts of alcohol are crucial to eliminating the extraction step used in JP '662 as discussed below. In addition, claims 20-29 claim the use of only the proteinaceous product and reducing agent. There is no requirement for the presence of any alcohol. Therefore, Applicants submit that one of ordinary skill in the art would not expect sufficient amounts of undesirable components would be removed using little or no alcohol and no extraction step.

Second, the undesirable components are removed from the proteinaceous product, in the present invention, not by extraction with alcohol but by evaporation upon release of the pressure. This is possible due to the small amount of alcohol or aqueous phase present in the instant method. The MPEP states that ". . . the omission of an element and retention of its function is an indicia of unobviousness." [MPEP 2144.04 (II B)] Applicants submit that the JP '662 method includes the step of alcohol extraction for removal of the undesirable compounds present in the preparation. The present invention dispenses with the need for the extraction step. However, the function of eliminating undesirable components is retained by removal of these undesirable components by venting of the pressure generated by the high temperature and pressure used in the methods. Applicants submit that elimination of the extraction step leads to considerable savings in time and cost.

Third, the methods of the present invention include using a higher temperature and pressure than in JP '662. All of the teachings in JP '662 teach a temperature that is below 70°C. The JP '662, in fact, teaches away from temperatures higher than 70°C. "But when the temperature was higher than 70°C , the color tone of the CSP obtained decreased, which was undesirable." See JP '662, page 4 of translation. The Examiner commented regarding well known inverse relationship between time and temperature. Applicants note that the phenomenon of decreasing time by increasing the temperature is known. However, the Applicants submit that chemical processes and in particular biological molecules are susceptible to changes in characteristics when subjected to a high temperature or pressure. In other words, a reaction may be carried out for a particular length of time at a certain temperature but the reaction may not be amenable to being carried out with the expectation of achieving similar results by merely speeding up the reaction by increasing the temperature. Significant temperature and pressure differences can alter the way a reaction proceeds and the products that are obtained at the end of the reaction. Applicants further submit that a person of ordinary skill in the art recognizes that one can not simply speed up the reaction time by increasing the temperature and not suffer deterimental consequences.

In conclusion, there is no teaching or suggestion in JP '662 or any other cited art that proteinaceous products can be reduced by reducing agent and processed without the need for an extraction step. The only place where one can find the motivation or suggestion for obtaining a proteinaceous product with enhanced solubility and color characteristics by reduction and use of high temperatures and pressures but without the need for extraction is Applicant's disclosure. To use Applicant's disclosure as a guide is impermissible.

Based on the above discussion, Applicants respectfully request the removal of the rejection of claims under 35 U.S.C over JP '662.

The Office Action rejected claims 1-4, 8-15, 20, 21 and 26-32 under 35 U.S.C. 103(a) as being unpatentable over Ferrara et al. The Office Action stated that Ferrara et al discloses a method preparing a soy protein product by blending the protein with alcohol and also a reducing agent at a temperature above ambient temperature. The Office Action further stated that the specific alcohols, and holding time in Ferrera et al. are different than in the present invention but it would have been within the purview of an ordinary skilled artisan to arrive at the present invention. The Examiner again states that, as in JP '662, the relationship between time, temperature and pressure can be optimized through routine experimentation.

Applicants submit that Ferrera et al does not teach or suggest the present invention. The use of an extraction step is salient to the success of Ferrera et al. Ferrera et al teach removal of the oxidized reducing agents by the use of a solvent extraction system. As discussed above for JP '662, the present invention does not include an extraction step using solvents. Furthermore, all of the processing steps in Ferrera et al. are carried out at temperatures well below the temperatures of the present invention. The proteinaceous material of the present invention is subjected to high temperature and pressure and any gaseous components are released by venting the pressure. With regard to Examiner's comments regarding the relationship between time, temperature and pressure, Applicants submit that, as discussed above, a person of ordinary skill in the art would recognize that increasing the temperature and pressure of a reaction does not merely reduce the reaction time but might also lead to alteration of the properties of the reaction components leading to unpredictable results.

Based on the above discussion, Applicants respectfully request the removal of the rejection of claims under 35 U.S.C over Ferrera et al..

The Office Action rejected claims 1-4, 8-15, 20, 21 and 26-32 under 35 U.S.C. 103(a) as being unpatentable over Melnychyn et al. The Office Action stated that Melnychyn et al discloses a method preparing a soy protein product by blending the protein with alcohol and also a reducing agent at a temperature above ambient temperature. The Office Action further stated that Melnychyn et. al is silent regarding the holding times greater than 10 minutes but it would have been within the purview of an ordinary skilled artisan to arrive at the present invention. The Examiner again states that, as in JP '662 and Ferrera et al., the relationship between time, temperature and pressure can be optimized through routine experimentation.

Applicants submit that Melnychyn et al does not teach or suggest the present invention. The use of an extraction step is also salient to the success of Melnychyn et al. Melnychyn et al teach removal of the undesired components by an extraction system. As discussed above, the present invention does not include an extraction step using solvents. Once again, only Applicants' disclosure suggests that a desirable proteinaceous product can be obtained without the need for extraction. Furthermore, all of the processing steps in Melnychyn et al. are carried out at temperatures well below the temperatures of the present invention. The proteinaceous material, in the present invention, is subjected to high temperature and pressure and any gaseous components are released by venting the pressure. With regard to Examiner's comments regarding the relationship between time, temperature and pressure, Applicants submit that, as discussed above, a person of ordinary skill in the art would recognize that increasing the temperature and pressure of a reaction does not merely reduce the reaction time but might also lead to alteration of the properties of the reaction components leading to unpredictable results.

Based on the above discussion, Applicants respectfully request the removal of the rejection of claims under 35 U.S.C over Melnychyn et al..

The Examiner rejected claims 16, 17, 33 and 34 under 35 U.S.C. 103(a) as being unpatentable over JP 55-88662, Melnychyn or Ferrara et al taken together with WO 95/04467 (WO '467). The Office Action stated that it is well-known to include a protein source such as soybean protein to animal feed compositions as taught in WO '467 and it would have been obvious to one having ordinary skill in the art to include soybean protein concentrate to animal feed.

As discussed above, JP '662, Ferrara et al. and Melnychyn et al. do not teach or suggest the present invention. WO '467 relates to animal feed compositions. The methods used to obtain the animal feed compositions in WO '467 are entirely different than the ones used in the instant invention. Pages 3 and 4 referred to by the Examiner in WO '467 merely suggest the use of soybean protein in animal feed but they do not suggest the use of the proteinaceous product prepared according to the present invention. There is no teaching in WO '467 that taken together with JP '662, Ferrara et al. or Melnychyn would have resulted in the present invention.

Based on the discussion above, the Applicants respectfully request the withdrawal of the rejections under 35 U.S.C. 103(a) over JP 55-88662, Melnychyn or Ferrara et al taken together with WO 95/04467 (WO '467)

It is believed that the elected claims are neither taught nor suggested by the prior art, and a Notice of Allowance is respectfully requested.

The Director is authorized to charge any fee deficiency required by this paper or credit any overpayment to Deposit Account No. 23-1123.

Respectfully submitted,

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Japanese Kokai Patent Application No. Sho 55[1980]-88662

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JAPANESE PATENT OFFICE
PATENT JOURNAL (A)
KOKAI PATENT APPLICATION NO. SHO 55[1980]-88662

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METHOD FOR MANUFACTURING SOY PROTEIN CONCENTRATE

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Agent:	Jyohei Yamashita, patent attorney, and 1 other

Claim

A method for manufacturing soy protein concentrate by extracting alcohol-soluble components from defatted soybeans (starting material) with alcohol, characterized in that the extraction is carried out at 50-70°C with 50-65 v/v% alcohol solution containing 0.02-0.07% sulfites or hyposulfites.

Detailed explanation of the invention

The present invention relates to a method for manufacturing soy protein concentrate having improved viscoelasticity by extracting defatted soybean (as a starting material) with alcohol.

Soy protein contains the so-called isolated soy protein (a common name is ISP) which is excellent in functionality such as viscoelasticity. However, its need for a lot of equipment and the high cost of manufacture are drawbacks. Compared with this, concentrated soy protein powder (a common name is CSP) can be manufactured relatively inexpensively, which is an advantage. Because CSP has excellent flavor and color tone it has become widely used as a food material. Especially in the USA it has been used as a substitute for wheat flour and meat. The soybean odor or pigment of CSP is removed by extracting with alcohol so the flavor and color tone are improved; however, there is a problem in its functional characteristics. Especially when it is used in livestock meat products, the viscoelasticity of CSP hydrate is an important factor. For example, in Japan there are unique fish meat products (such as boiled fish paste, fish meat sausage, etc.) which are not produced in the USA, and when CSP is used in the fish meat products it is especially important to improve the viscoelasticity of the CSP hydrate.

The CSP hydrate gels itself has a certain feel and appearance. The type of feel that is most preferable was judged using the following method. Namely in the present invention attention is paid to boiled fish paste which is a representative fish meat product, and fish meat products were prepared to which various soy proteins had been added in advance, then the feel when eating them was evaluated by panelists. Hydrated gels of soy protein and boiled fish pastes were prepared and their viscoelasticity (texture characteristics) was measured. A concrete method for measuring viscoelasticity is as follows:

Method for measuring viscoelasticity:

In the case of CSP, CSP was mixed with water to give protein with 17.8% purity, followed by kneading for 5 min using a mixer (Hobart mixer), then it was packed in a glass tube (16 mm diameter and 100 mm long) using a rubber spatula, both ends of the glass tube were then plugged with rubber stoppers and it was heated at 80°C for 30 min in water. After cooling with water, it was put in a refrigerator overnight. The next day the CSP gel was pushed out from the glass tube and cut with a cheese cutter to 10 mm long to give a sample for measuring viscoelasticity.

Force-distance curves were prepared using an Instron Universal Machine Model TTCM. Generally speaking, the force-distance curves shown in Figure 1 were obtained and characteristic values were obtained using the following methods (M. Bourne: Texture profile of ripening pears, J. of Food Science, Vol. 33, No. 2, pp. 223-226).

Hardness 1: B_1
Hardness 2: B_2
Stringiness: C_1
Springiness: C_2
Cohesiveness: A_2/A_1
Adhesiveness: A_3
Gumminess: $A_2/A_1 \times B_1$
Chewiness: $A_2/A_1 \times B_1 \times C_2$

Namely hardness 1 and hardness 2 are expressed by the height of the first and the second peak, respectively. A_1 (area 1) is the work for the first compression and A_2 is the work for the second compression. Springiness is expressed by the distance in the second compression, in other words it is its resilience after the first compression. Stringiness is expressed by the distance covered by tensile force after the first compression and adhesiveness is the tensile work thereof. Cohesiveness, gumminess, and chewiness are expressed by the ratios or products of each characteristic value.

For the characteristic values measured by the above methods, the adhesiveness of boiled fish paste had a negative value, namely an undesirable value; and on the other hand it had desirable values for springiness, cohesiveness, gumminess, and chewiness.

An ordinary method for manufacturing CSP is as follows: defatted soybean with low degree of modification or defatted soybean is extracted with alcohol or an aqueous alcohol solution. Concretely, for example, it is extracted in a mixing vessel for a fixed period of time, followed by centrifugal separation or filtration into a cake (alcohol-insoluble matter) and miscella (alcohol-soluble matter). The alcohol-soluble components such as sugar, odorous components or lipid complexes are removed. Then if necessary, fresh alcohol is added to the cake and then extraction is repeated. The used alcohol can be reused after distillation. The cake obtained finally is dried under reduced pressure or vacuum to remove residual alcohol and water and finally pulverized to give CSP. The present inventors carried out a detailed study on reduction of the undesirable characteristic values of gels after heating the hydrate of CSP obtained from using such a manufacturing method and to improve the preferable characteristic values, and as a result they found that the following conditions were best in the manufacture of CSP.

(1) The concentration of alcohol used in the extraction is 50-65v/v%. In the case of extracting at least twice it is unnecessary to carry out the entire operation at this concentration but using this concentration only in the first extraction.

(2) The alcohol extraction temperature is 50-70°C.

(3) At the time of alcohol extraction, 0.02-0.07% sulfites or hyposulfites is present in the alcohol.

When the CSP manufactured under the above-mentioned conditions was used to manufacture boiled fish pastes, products with excellent viscoelasticity can be obtained.

In the following, the present invention will be explained concretely.

(1) 100 g defatted soybean powder with low degree of modification was treated with 50 v/v%, 65 v/v%, and 80 v/v% alcohol, respectively at 50°C for one hour with solvent ratio 1:6 w/w in a flask equipped with a stirrer. After suction filtration, a cake was obtained, then it was again extracted with alcohol of the same concentrations and solvent ratio 1:5 w/w (namely 500 g fresh alcohol having the respective concentrations was added) at 50°C for one hour. After suction filtration, the cake thus obtained was dried at room temperature and then it was pulverized to give three types of CSP. The viscoelasticity of the gel of CSP is shown in Figure 2. When the alcohol concentration was 50 v/v%, the adhesiveness was lowest and the hardness, gumminess, and chewiness were the highest and excellent. When the alcohol concentration was 80 v/v%, almost all the characteristic values were undesirable. When alcohol concentration was less than 50 v/v%, it was difficult to filter, for example, when the extraction was carried out using 40 v/v% alcohol, in fact separation was impossible by filtration under reduced pressure. Moreover when the concentration of alcohol is further reduced, the proportion of protein moving into the alcohol increases, which is undesirable. Due to the above-mentioned reasons we can state that the suitable alcohol concentration is 50-65 v/v%. In this case it is not always necessary that the alcohol concentration in the second extraction be the same as that of the excellent first extraction. For facilitating the subsequent drying process, 80-90 v/v% concentration was rather economic. Even so, there is almost no change in the characteristic values.

(2) Next, 100 g defatted soybean powder with low degree of modification was extracted with 50 v/v% alcohol with solvent ratio 1:6 w/w for one hour at 40, 50, 60, 65, 70, and 75°C, respectively and then suction-filtered to give cakes. Then the cakes were similarly extracted with 50 v/v% alcohol with solvent ratio 1:5 w/w for one hour at 40, 50, 60, 65, 70, and 75°C, respectively and then filtered, and dried at room temperature. The viscoelasticity of the heated hydrated gels of the pulverized products is shown in Figure 3. When the extraction temperature was higher than 50°C, the adhesiveness was low and the hardness, gumminess, cohesiveness, and chewiness were high. But when the temperature was higher than 70°C, the color tone of the CSP obtained decreased, which was undesirable. Therefore the extraction temperature is preferably 50-70°C.

(3) Next, 0.005-0.098% sodium sulfite was added to 100 g defatted soybean powder with low degree of modification, followed by extracting with 50 v/v% alcohol with solvent ratio 1:6 w/w at 50°C for one hour. In the second extraction, no fresh sodium sulfite was added but

extraction was carried out with 50 v/v% alcohol and solvent ratio 1:5 w/w at 50°C for one hour to give CSP. The viscoelasticity of each hydrated gel is shown in Figure 4. When the range of sodium sulfite added was 0.02-0.07%, all the characteristic values were good and especially the hardness and chewiness were improved. Similar results were obtained when other sulfites or hyposulfites were used instead of sodium sulfite.

From these results it is clear that in the manufacture of CSP if the alcohol concentration is 50-65 v/v%, the extraction temperature is 50-70°C, and in the presence of 0.02-0.07% sulfite or hyposulfite, the viscoelasticity of CSP hydrate can be improved remarkably, and moreover the flavor and color tone are not deteriorated. The use of CSP manufactured by the method of the present invention in various foods such as boiled fish pastes, sausages, etc., can be anticipated greatly.

Application example

CSP was manufactured by extracting defatted soybean powder with a low degree of modification under the following two different conditions (A: the present invention was used and B: the present invention was not used).

A.......(First extraction) alcohol concentration 50 v/v%, temperature 60°C, solvent ratio 1:6 w/w, addition of 0.02% Na_2SO_3 based on the starting material

(Second extraction) alcohol concentration 90 v/v%, temperature 60°C, solvent ratio 1:5 w/w.

B.......(First extraction) alcohol concentration 70 v/v%, temperature 30°C, solvent ratio 1:6 w/w.

(Second extraction) alcohol concentration 90 v/v%, temperature 50°C, solvent ratio 1:5 w/w.

The viscoelasticity of these CSP and that of the following commercially available CSP were compared and the results are shown in Table 1.

C...... Promosoy 1000 (Central Soya Co.)

From these results it is clear that the hardness, springiness, chewiness, gumminess, and adhesiveness of product A prepared by the method of the present invention are much better than those of product B which was prepared not using the method of the present invention and product C which is a commercially available product.

Table 1

	① 硬さ1	② 硬さ2	③ 弾性	④ 凝集性	⑤ 付着性	⑥ チューイング性	⑦ ガム性	⑧ 曳糸性
A	45.7	37.8	2.3	0.16	−0.05	15.9	5.7	1.9
B	14.7	13.7	1.1	0.15	−0.50	3.0	2.7	1.1
C	24.7	22.1	1.2	0.14	−0.35	4.3	3.9	1.5

Key:	1	Hardness 1
	2	Hardness 2
	3	Springiness
	4	Cohesiveness
	5	Adhesiveness
	6	Chewiness
	7	Gumminess
	8	Stringiness

Brief description of the figures

Figure 1 shows force-distance curves measured by an Instron Universal Machine for measuring viscoelasticity, and Figures 2-4 show the viscoelasticity of hydrates of CSP manufactured under various conditions.

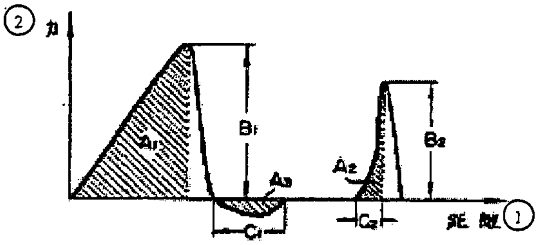

Figure 1

Key:	1	Distance
	2	Force

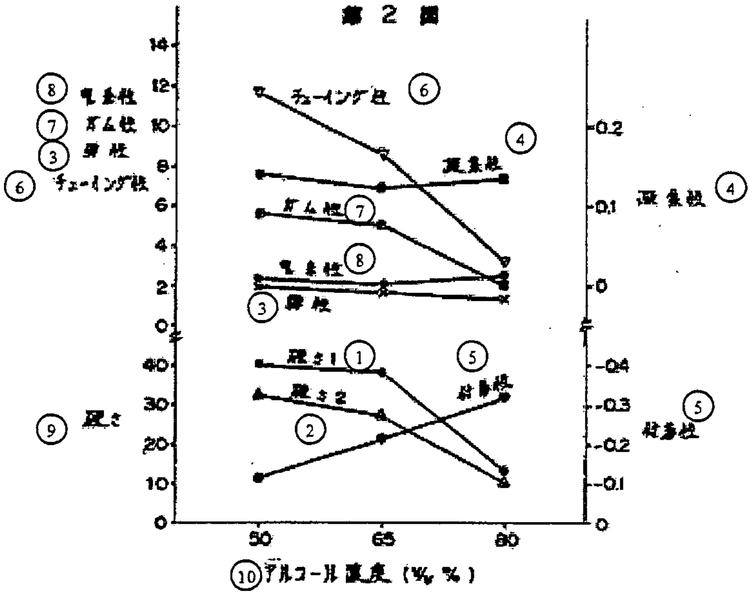

Figure 2

Key	1	Hardness 1
	2	Hardness 2
	3	Springiness
	4	Cohesiveness
	5	Adhesiveness
	6	Chewiness
	7	Gumminess
	8	Stringiness
	9	Hardness
	10	Alcohol concentration (v/v%).

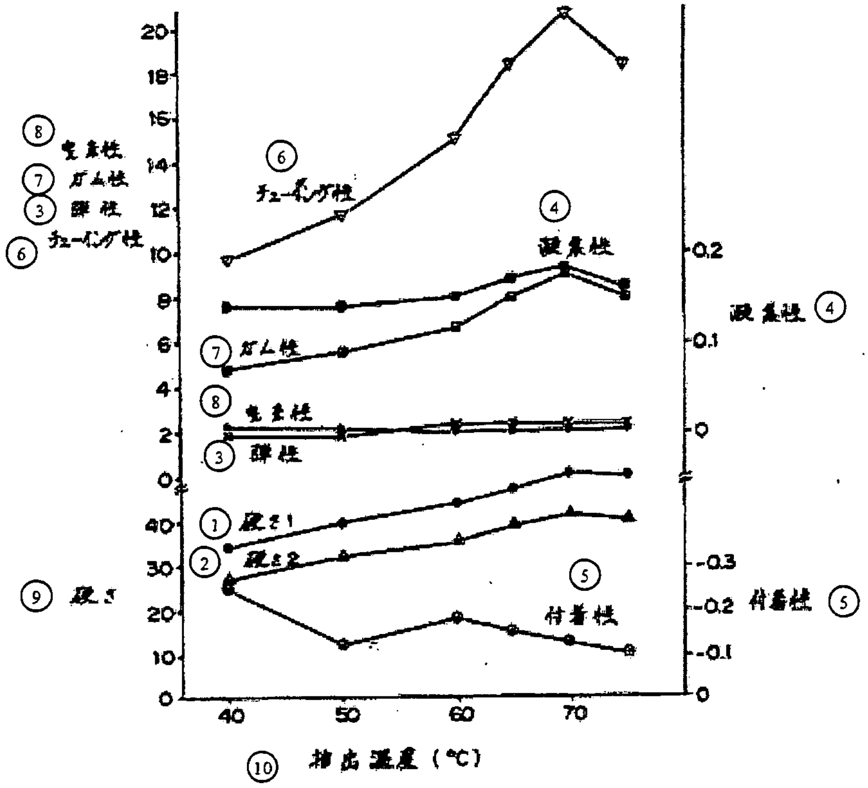

Figure 3

Key:	1	Hardness 1
	2	Hardness 2
	3	Springiness
	4	Cohesiveness
	5	Adhesiveness
	6	Chewiness
	7	Gumminess
	8	Stringiness
	9	Hardness
	10	Extraction temperature (°C)

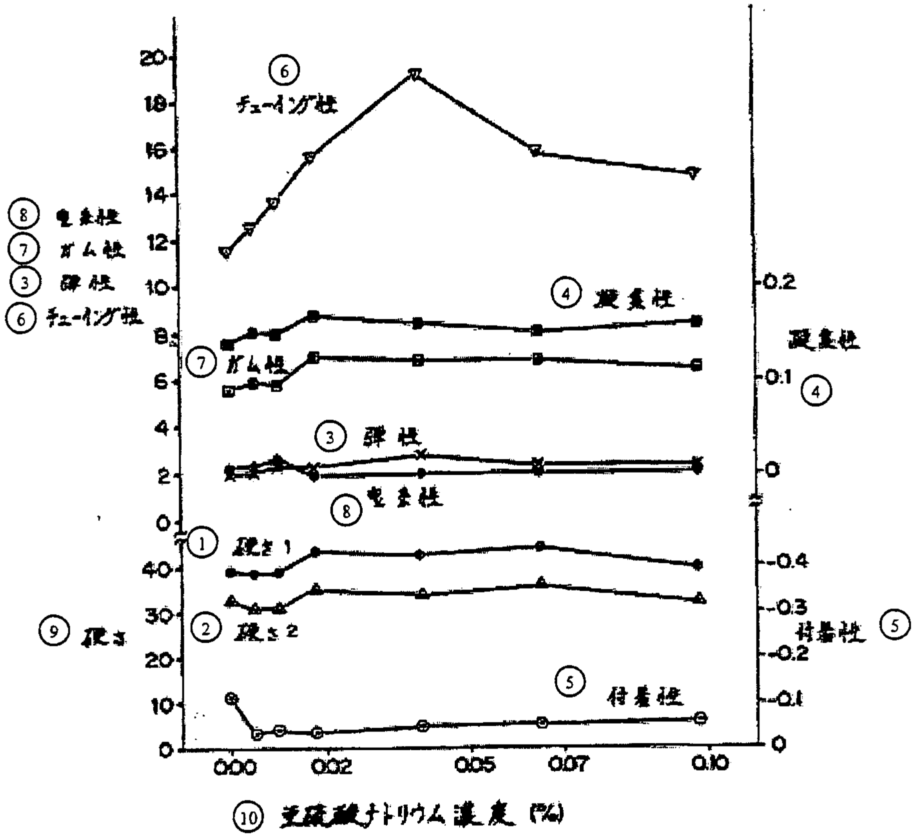

Figure 4

Key:

1	Hardness 1
2	Hardness 2
3	Springiness
4	Cohesiveness
5	Adhesiveness
6	Chewiness
7	Gumminess
8	Stringiness
9	Hardness
10	Concentration of sodium sulfite (%)

PAT-NO: JP355088662A

DOCUMENT-IDENTIFIER: JP 55088662 A

TITLE: PREPARATION OF CONCENTRATED SOYBEAN PROTEIN

PUBN-DATE: July 4, 1980

INVENTOR-INFORMATION:
NAME
MIKAMI, YASUO

ASSIGNEE-INFORMATION:

NAME	COUNTRY
NISSHIN OIL MILLS LTD:THE	N/A

APPL-NO: JP53159299

APPL-DATE: December 26, 1978

INT-CL (IPC): A23J001/14

US-CL-CURRENT: 530/378

ABSTRACT:

PURPOSE: To prepare a concentrate of **soybean protein** having excellent visco-elastic properties, from defatted soybeans, by extracting the soybeans with a 50&sim;65v/v% **alcohol** in the presence of a **sulfite,** etc. at 50&sim;70&deg;C.

CONSTITUTION: Defatted soybeans are extracted with an alcohol containing 50&sim; 65v/v% of alcohol, in the presence of 0.02&sim;0.07% of a sulfurous acid salt or a hyposulfurous acid salt, at 50&sim;70&deg;C. When the extraction is repeated twice or more, at least the first extraction is carried out using the alcohol of the above concentration. The cake (alcohol-insoluble part) thus obtained is dried to obtain a CSP (concentrated soybean protein

power) giving a
hydrate having high visco-elasticity and useful as a raw material of fish
paste, sausage, etc.

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